

Summary Report
“Workshop on Cognitive Science
From Cellular Mechanisms to Computational Theories (CS-2009)”
May 25-27, 2009

Supported by NSF, AOARD and USC, the Workshop on Cognitive Science: From Cellular Mechanisms to Computational Theories was held in Beijing, China from May 25th to 27th, 2009. The workshop was organized by Drs. Zhonglin Lu, Xiaoping Hu, Guoqiang Bi and Richard Shiffrin, in collaboration with Dr. Yuejia Luo from National Key Lab of Cognitive Neuroscience and Learning at Beijing Normal University.

The workshop has several related aims, each designed to promote Cognitive Science in China: **(1)** promote interchanges across multiple sub-disciplines of cognitive science that investigate cognition at different levels and using different tools, **(2)** survey the current state of cognitive science research in China and showcase to scientists and students in China the quantitative methods, successes, and interdisciplinary nature of cognitive science, and **(3)** establish channels for collaborative research, and initiate exchange programs at multiple levels.

This was the first workshop on cognitive science in China that brought researchers from a broad spectrum of distinct and connected sub-disciplines together to seek cross-disciplinary interactions and collaborations. The workshop was a tremendous success. We had 17 distinguished speakers and more than 180 participants (postdocs and graduate and undergraduate students) from many major universities, research institutes and organizations. The workshop also accepted 59 abstracts, 27 of them were presented as posters in the conference. In addition, there was a two-hour discussion session in the end of each day during the workshop.

Summary of the presentations:

The workshop encapsulated altogether 6 sessions on various thematic areas and 17 invited speakers presented their research. The workshop also accepted 59 abstracts, 27 of them were presented as posters in the conference. In addition, there were Each day ended with a panel discussion to address various issues raised during the presentations.

Workshop Opening Remarks: During the opening session, Dr. Richard Shiffrin welcomed the workshop attendees to the fantastic city, Beijing and thanked the participants for their impressive research work in cognitive neuroscience. He also thanked the local organization for helping prepare this remarkable event and wished a very successful meeting.

❖ Dr. Wilson S. Geisler (David Wechsler Regents Professor of Psychology,

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| 13. SUPPLEMENTARY NOTES | | | | | |
| 14. ABSTRACT Grantee investigated the current state of the art in how understanding of cellular mechanisms can be used to develop computational theories in the cognitive sciences. The review was conducted in a workshop setting, with three organized discussion sessions. Recognized experts were invited to cover advances in four areas: (1) Cognitive Psychology, (2) Computational Cognition, (3) Neural Circuits, and (4) Brain Imaging. All the invited speakers were asked and encouraged to participate in the three organized discussion sessions: (1) Current issues and directions in cognitive science, (2) Funding directions and mechanisms, and opportunities for collaborative research, and (3) Exchange programs and training opportunities for graduate and postdoctoral students. An edited volume based on the invited talks, ?Frontiers of Cognitive Science: From Cellular Circuitry to Computational Cognition?, is planned | | | | | |
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University of Texas, Austin) spoke on “Natural Systems Analysis of Contour Grouping” and demonstrated the great potential of “natural systems analysis” for producing advances in behavioral science and systems neuroscience.

- ❖ Dr. Zhaoping Li (Professor, Department of Computer Science, University College London) lectured on “A bottom-up saliency map in the primary visual cortex --- theory and experimental tests” and described experimental confirmations of three predictions.
- ❖ Dr. Wu Li (Professor, Institute of Cognitive Neuroscience and Learning, Beijing Normal University) lectured on “Adaptive Visual Processing in the Primary Visual Cortex” and found that their recent studies reversed the standard model of feed-forward visual processing, showing that the analysis of the visual image depends on countercurrent streams of processing.
- ❖ Dr. Barbara A. Doshier (Professor, Department of Cognitive Sciences, University of California, Irvine) spoke on “Mechanisms and Modes of Perceptual Learning”.
- ❖ Dr. Roger Ratcliff (Distinguished Professor of Social and Behavioral Sciences and Professor, Psychology, Ohio State University) lectured on “Modeling Perceptual and Cognitive Decision Processes” and presented results that explain why older subjects are slower in terms of the aspects of performance that are optimized.
- ❖ Dr. Richard M. Shiffrin (Distinguished Professor and Luther Dana Waterman Professor of Psychological and Brain Sciences, Indiana University, Bloomington) spoke on “The Co-evolution of Knowledge and Event Memory” and explained how knowledge grows from experience and how knowledge guides our encoding and perception of events.
- ❖ Dr. Yi Rao, (Professor & Dean, Peking University School of Life Sciences; Investigator, National Institute of Biological Sciences (NIBS)) spoke on “Molecular Biology of Social Interactions” and applied a genetic approach to study molecular and cellular mechanisms of aggression, courtship and maternal behavior.
- ❖ Dr. Dezhe Jin (Assistant Professor, Department of Physics, Pennsylvania State University) lectured on “Neural network model of song syntax in songbirds” and discussed the structure and dynamics of neural networks underlying the stereotypy of the birdsong syllables and the flexibility of their sequences.
- ❖ Dr. Guoqiang Bi (Associate Professor, Neurobiology, University of Pittsburgh; Professor, University of Science and Technology of China) spoke a topic on “Hebbian plasticity and reverberate activity in neuronal circuits” and discussed the observed dynamic properties of network reverberation, its synaptic mechanisms, as well as its interaction with Hebbian synaptic plasticity.
- ❖ Dr. Andrew Schwartz (Professor Neurobiology, University of Pittsburgh)

present a lecture on “Useful Signals from Motor Cortex” and showed that closed-loop control of a cortical prosthesis could produce very good brain-controlled movements in virtual reality and extended this work to robot control.

- ❖ Dr. Yang Dan (Howard Hughes Investigator and Professor of Neurobiology, UC Berkeley) spoke on “Neuromodulation of global brain state” and addressed the effect of basal forebrain cholinergic activation on visual processing and presented a surprising finding that burst spiking of a single cortical neuron could modulation global brain states.
- ❖ Dr. Sheng He (Professor, Department of Psychology, University of Minnesota) lectured on “Conscious and unconscious visual processing of faces, body movements, tools and words”.
- ❖ Dr. Jun Zhang (Professor, Department of Psychology, University of Michigan, Ann Arbor. President, Society for Mathematical Psychology) spoke on “Understanding Neural Basis of Decision Making by Determining Locus in Stimulus-Response Arc of Neural Recordings”.
- ❖ Dr. Jerome R. Busemeyer (Professor of Psychological & Brain Sciences, Indiana University) spoke on “Building Bridges between Neural Models and Complex Decision Making Behavior”.
- ❖ Dr. Xiaoping Hu (Professor and Georgia Research Alliance Eminent Scholar in Imaging, Coulter Dept of Biomedical Engineering at Georgia Tech and Emory University) lectured on “Deciphering Neural Connectivity from fMRI Data with Granger Causality Analysis”.
- ❖ Dr. Zhong-Lin Lu (William M. Keck Chair in Cognitive Neuroscience and Professor of Psychology and Biomedical Engineering, University of Southern California) spoke on “Cognitive and Neural Mechanisms of Attention” and concluded that covert spatial attention operates via two independent mechanisms:(1) excluding external noise/distractors in the target region, and (2) enhancing stimulus in the target location.
- ❖ Dr. Edgar (Ted) DeYoe (Professor, Department of Cell Biology, Neurobiology and Anatomy, University of Wisconsin, Milwaukee) spoke on “Neuroimaging Aids for Treatment of Brain Cancer and Other Focal Pathologies”

This summary report serves as a brief overview of the workshop and outlines the speaker’s talks. A more comprehensive archive of this event is available at <http://psychbrain.bnu.edu.cn/cs2009/index.html> , where users can access the photo galleries from the workshop, as well as links to supplementary documents and other features.